

Stem Cell Regulation: Niche and Signaling

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How stem cells are maintained *in vivo* and which signal pathways regulate the balance between self-renewal and differentiation are fundamental questions in stem cell biology. Here we summarize our recent studies regarding the role of BMP signaling in regulation of stem cell behavior in both the hematopoietic and intestinal systems. These studies provide evidence to show that BMP signaling plays an important role in regulating stem cell property. However, the BMP signal utilizes different mechanisms to fulfill this purpose: in the hematopoietic stem cell compartment it controls stem cell number through regulation of the niche size; in the intestinal stem cell compartment it directly controls activation and self-renewal of stem cells through restriction of Wnt/ β -catenin activity. The *Bmpr1a* mutant mouse is an elegant model which has allowed us to identify the HSC niche, an enigma for more than 25 years in the field, and to investigate the interaction between BMP and Wnt signaling pathways in regulating intestinal stem cell activation and self-renewal. Our work provides more evidence to demonstrate the essential function of the niche in maintenance of stem cells and shows that multiple signals are required to maintain a balanced control of stem cell self-renewal.